

# *Meyenodendron borealis* gen. et sp. nov., a new lepidodendrid of angaran affinity from northern Alaska

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## Synopsis

Several angaran lepidodendrids are reported from the Brooks Range, Alaska. One specimen, putatively from the Kuna Formation of the Lisburne Group, shares the characters of both *Tomiodendron* Radczenko and *Angarophloios* Meyen. This specimen is described and named *Meyenodendron borealis* gen. et sp. nov. A similar specimen from the Lower Namurian of north-eastern U.S.S.R. is named *Meyenodendron sibirica*.

## Introduction

Meyen (1976), in his paper on angaran Carboniferous and Permian lepidophytes, redefined both *Tomiodendron* Radczenko and *Angarophloios* Meyen. *Tomiodendron* has elongated, oval, rhomboid or sagittal leaf cushions with persistent leaves and is ligulate. *Angarophloios* has obovate, oval or rhomboidal leaf cushions with rounded corners and infrafoliar bladders. Its leaves are persistent but there is no evidence of ligule pits in the axils of the leaves. The same distinction between the two genera is maintained in the key of lycophytes given by Thomas & Meyen (1984).

A single specimen was also figured by Meyen (1976: text-fig. 25; pl. 11, fig. 84) that combined characters of *Tomiodendron* and *Angarophloios*. Its leaf cushions show both ligule pit casts, as in *Tomiodendron*, and infrafoliar bladders, as in *Angarophloios*. The extended lower angles of the leaf cushions are more like those of *Tomiodendron*. Meyen did not refer the specimen to either genus and did not attempt to give it a name. A further specimen has since been found in Alaska showing the same combination of characters of the two genera. It allows us to both re-evaluate the taxonomic position of such intermediate forms and to comment on their geographical distribution.

## Material

The new specimen came from the Kurupa Hills region of the Brooks Range in northern Alaska: lat. 68° 22' 44" N, long. 154° 48' 20" W (Fig. 1). It was found as a 'float' by Jerry Siok (University of Alaska) and appears to have come from a black chert horizon in the Kuna Formation of the predominantly marine Lisburne Group. Radiolaria and conodonts from the chert have generally been dated as Meramecian and Chesterian (personal communication C. G. Mull, 1984). This is equivalent to late Viséan to middle Namurian.

The specimen has been deposited in the British Museum (Natural History), London (register no. V.62164).

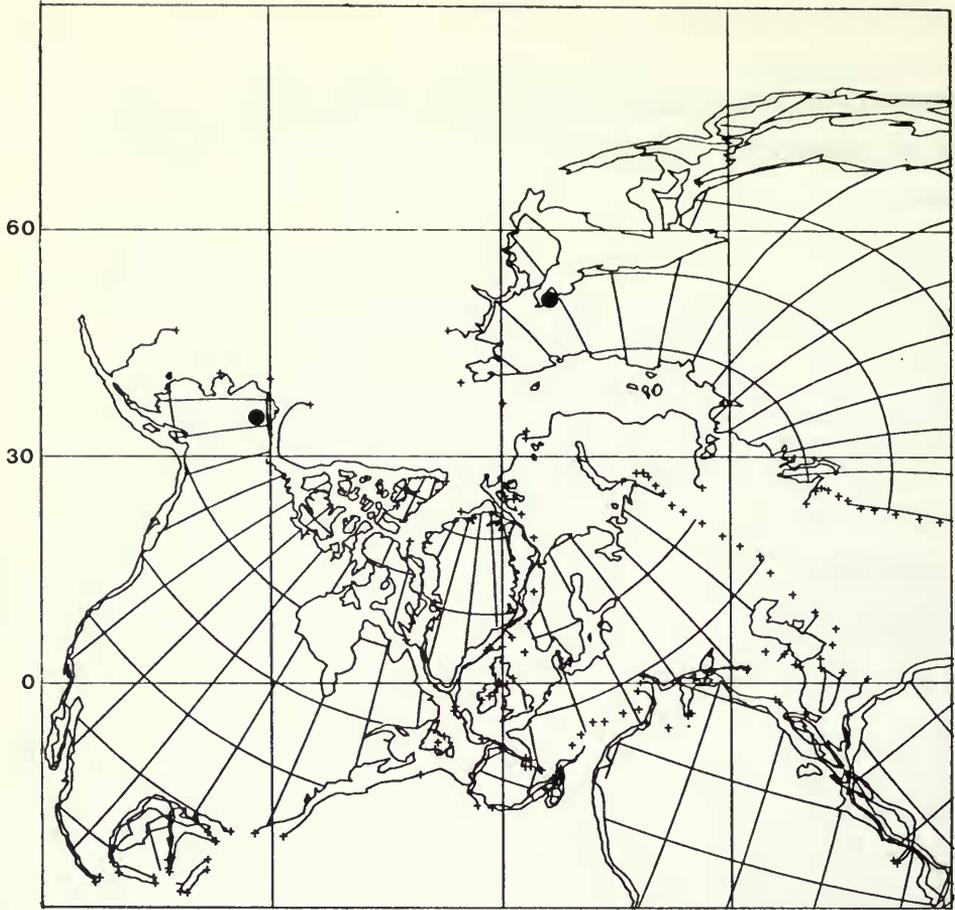


Fig. 1 Palaeocontinental reconstruction for the Namurian showing the relative positions of Alaska and Siberia. Solid circles indicate *Meyenodendron* localities. After Smith, Hurley & Briden (1981), map C.

## Systematic descriptions

Division LYCOPHYTA

Order PROTOLEPIDODENDRALES

Family PROTOLEPIDODENDRACEAE (satellite taxon)

*MEYENODENDRON* gen. nov.

**DIAGNOSIS.** Leaf cushions with distinct outlines, obovate with rounded upper and side angles. Phyllotaxy lepidodendroid. Leaves persistent, attached to upper angle of the leaf cushion. Infracoliar bladder in the upper half of the cushion. Ligule pits in the upper angles of the leaf cushions.

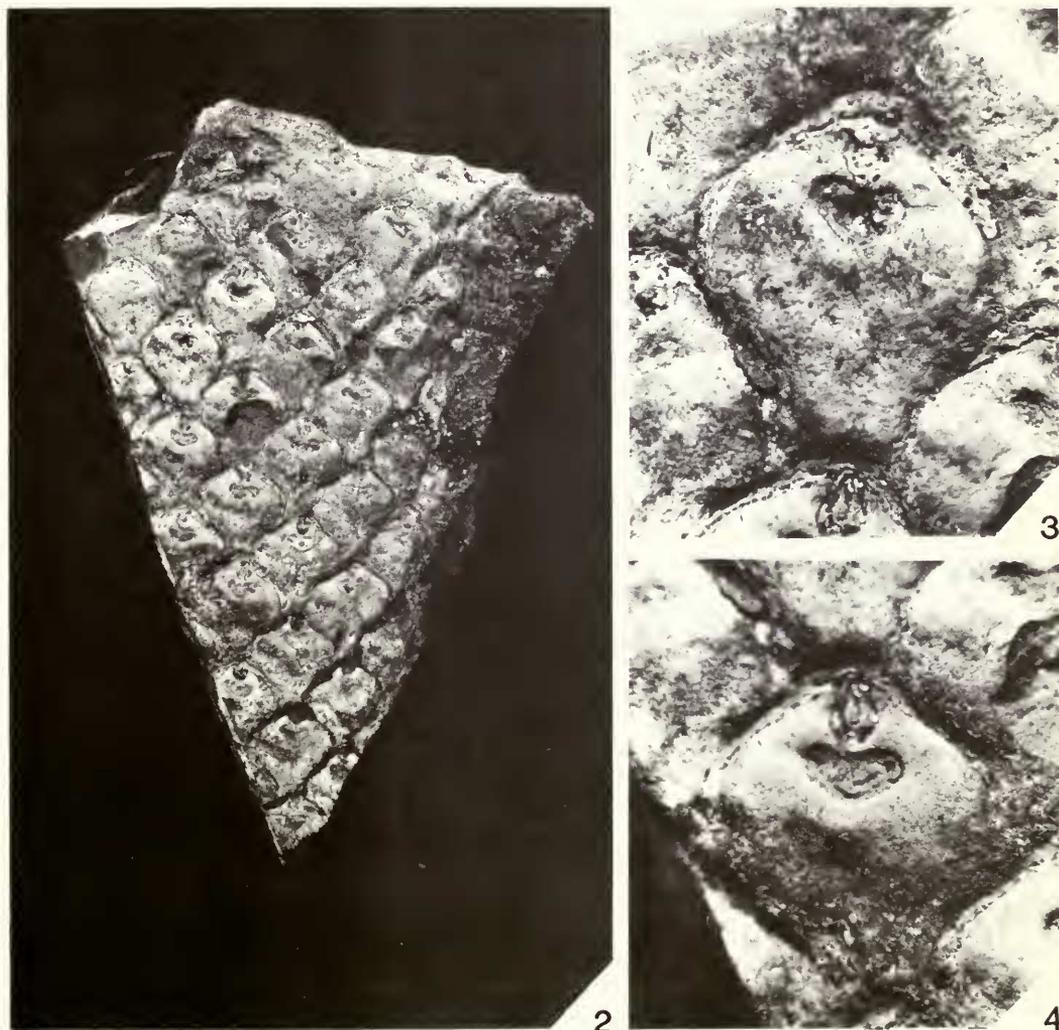
**TYPE SPECIES.** *Meyenodendron borealis* sp. nov.

**NAME.** For S. V. Meyen.

**DESCRIPTION.** The single specimen shows a small area of stem surface, well preserved as a cast with raised leaf cushions in two opposed parastiches at an angle of about  $86^\circ$  to each other. The cushions are all about 13 mm long and 10.5 mm broad, with rounded upper and lateral

angles. Laterally elongated and somewhat heart-shaped depressions, which we equate with Meyen's infrafoliar bladders, are present in the upper halves of the leaf cushions. A ligule pit cast is also clearly visible in the upper angle of each leaf cushion. The best preserved of these are flask-shaped and attached to remnants of coal running around the upper angles of the leaf cushions. The thickening of this coal into a triangular 'cap' to the cushion probably represents the broken base of the leaf lamina which was lost when the rock was split to expose the cushions. Unfortunately, no organic residue was preserved on any of the leaf cushions so no cuticle could be prepared.

COMPARISON. The possession by leaf cushions of both a ligule pit and an infrafoliar bladder poses a problem, for these two features have previously been used as major characters for generic distinction. *Tomiodendron* and *Angarophloios*, as defined by Meyen (1976), are clear and understandable genera based on leaf cushion characters. Meyen's use of *Tomiodendron* has been followed by Thomas & Purdy (1982). De Rouvre (1984), however, has described some



Figs 2-4 *Meyenodendron borealis* gen. et sp. nov. Fig. 2, holotype V.62164,  $\times 1$ . Fig. 3, leaf cushion of same showing infrafoliar bladder,  $\times 4$ . Fig. 4, leaf cushion of same with ligule pit and infrafoliar bladder,  $\times 4$ .

rather different Lower Carboniferous lycophytes from Niger as *Tomiodendron varium*. They are described and drawn as having parichnos on their cushions, although the parichnos cannot be seen in the photographs.

It seems to us neither desirable nor practical to blur the definition of either *Tomiodendron* or *Angarophloios* by including intermediates. Neither does it seem sensible to merge the two. Therefore we propose to erect the new genus *Meyenodendron*, and include it in the list of satellite taxa of Protolopodiales outlined by Thomas & Brack-Hanes (1984). There are, however, sufficient differences between the two known specimens to prevent us believing them to be conspecific. The shapes and sizes of the ligule pits and infrafoliar bladders of the two show the same magnitude of differences as are used to distinguish other species of angaran lycophytes. We therefore prefer to create two species, even though only one specimen is known of each.

*Meyenodendron borealis* sp. nov.

Figs 2–5

DIAGNOSIS. Leaf cushions 13 mm long, 10.5 mm broad. Infrafoliar bladders broadly cordate, central, 2 mm long, 4 mm broad. Ligule pit casts flask-shaped, 2 mm long, 1.5 mm broad at base.

NAME. 'Northern'.

HOLOTYPE. No V.62164, British Museum (Natural History), London. Figs 2–5.

LOCALITY. Collected as 'float' in Kurupa Hills, Brooks Range, Alaska.

STRATIGRAPHY. Not *in situ*. Possibly Meramecian to Chesterian: Viséan to Namurian.

*Meyenodendron sibirica* sp. nov.

1976 Lepidophyte, incertae sedis; Meyen: text-fig. 25; pl. 11, fig. 84.

DIAGNOSIS. Leaf cushions 25 mm long, 15 mm broad. Infrafoliar bladders oval, 5 mm long, 4 mm broad. Ligule pits very small, about 1 mm long.

NAME. 'Siberian'.

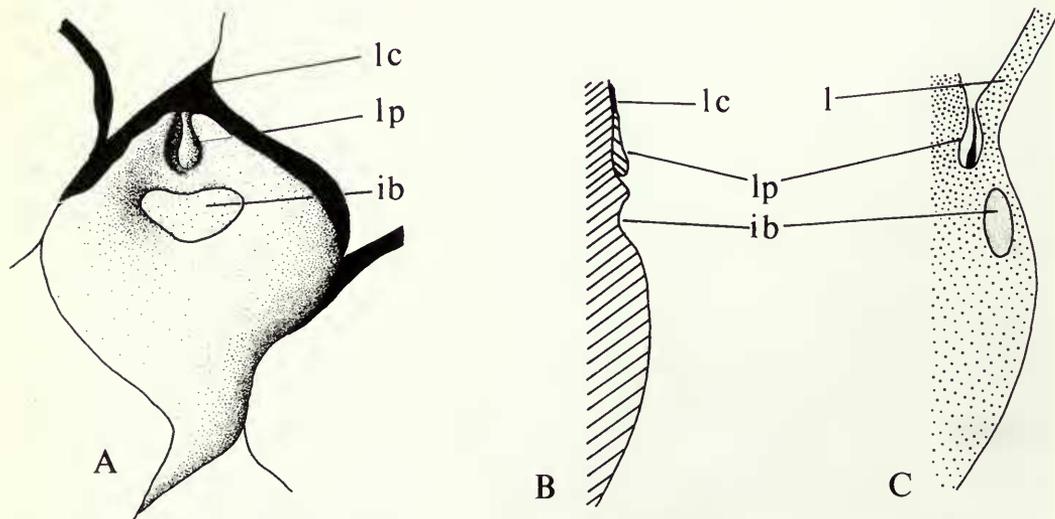


Fig. 5 *Meyenodendron borealis* gen. et sp. nov. Holotype, V.62164. A, leaf cushion as seen in surface view. B, median longitudinal section through a compressed leaf cushion as illustrated in A. C, reconstructed median longitudinal section through a leaf cushion as in life. (ib, infrafoliar bladder; l, leaf lamina; lc, leaf lamina compression; lp, ligule pit—with ligule in C).

HOLOTYPE. No 3791/156, Geological Institute, Academy of Sciences, Moscow.

LOCALITY. Paren River, left bank, 1.3 km below mouth of the Belye Snegi Creek, north-east of the Soviet Union.

STRATIGRAPHY. Khayamska suite, Serpukhovian stage (Lower Namurian).

### Discussion

The discovery in northern Alaska of a lycophyte that can be put into the same genus as one from north-eastern Siberia is very exciting. The Alaskan specimen is well preserved and the surface of the impression shows little sign of abrasion. We assume from this that the stem was not transported for any appreciable distance before it was fossilized. Unfortunately the fact that the specimen was not found *in situ* makes any assessment of the depositional environment meaningless. Any palaeogeographic interpretations based on a single such specimen might be regarded with suspicion, although other lepidodendrids of American affinity have also been collected recently from the Kurupa Hills. These, attributed by us to *Tomiodendron varium* (Radczenko) Meyen, *Ursodendron chacassicum* Radczenko and *Angarophloios* cf. *leclercqianus* Meyen, were all found *in situ* in units stratigraphically underlying that which probably yielded the *Meyenodendron*. They therefore correlate with Russian material of Tournasian to Viséan age.

It therefore seems that, during the early Carboniferous, northern Alaska and north-eastern Siberia had floral elements in common which are not found in Europe. From the evidence of such floral similarities it can be argued that these areas were in much closer proximity to one another at that time. This conclusion is contrary to some widely used palaeocontinental reconstructions (e.g. Smith *et al.*, 1981; see Fig. 1). Further studies of Alaskan Carboniferous floras are certainly needed if we are to obtain a clearer picture of the late Palaeozoic palaeogeography of the areas.

### Acknowledgements

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